SERVICE MANUAL



CORE AND KEY

SERVICE MANUAL

BEST ACCESS SYSTEMS™

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Written and designed by Best Access Systems and Avalon Group, Inc., Indianapolis, Indiana.

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1 GETTING STARTED

INTRODUCTION

The *Core and Key Service Manual* contains essential information to help you maintain your BEST cores and keys.

PRODUCT FAMILY DIAGRAM

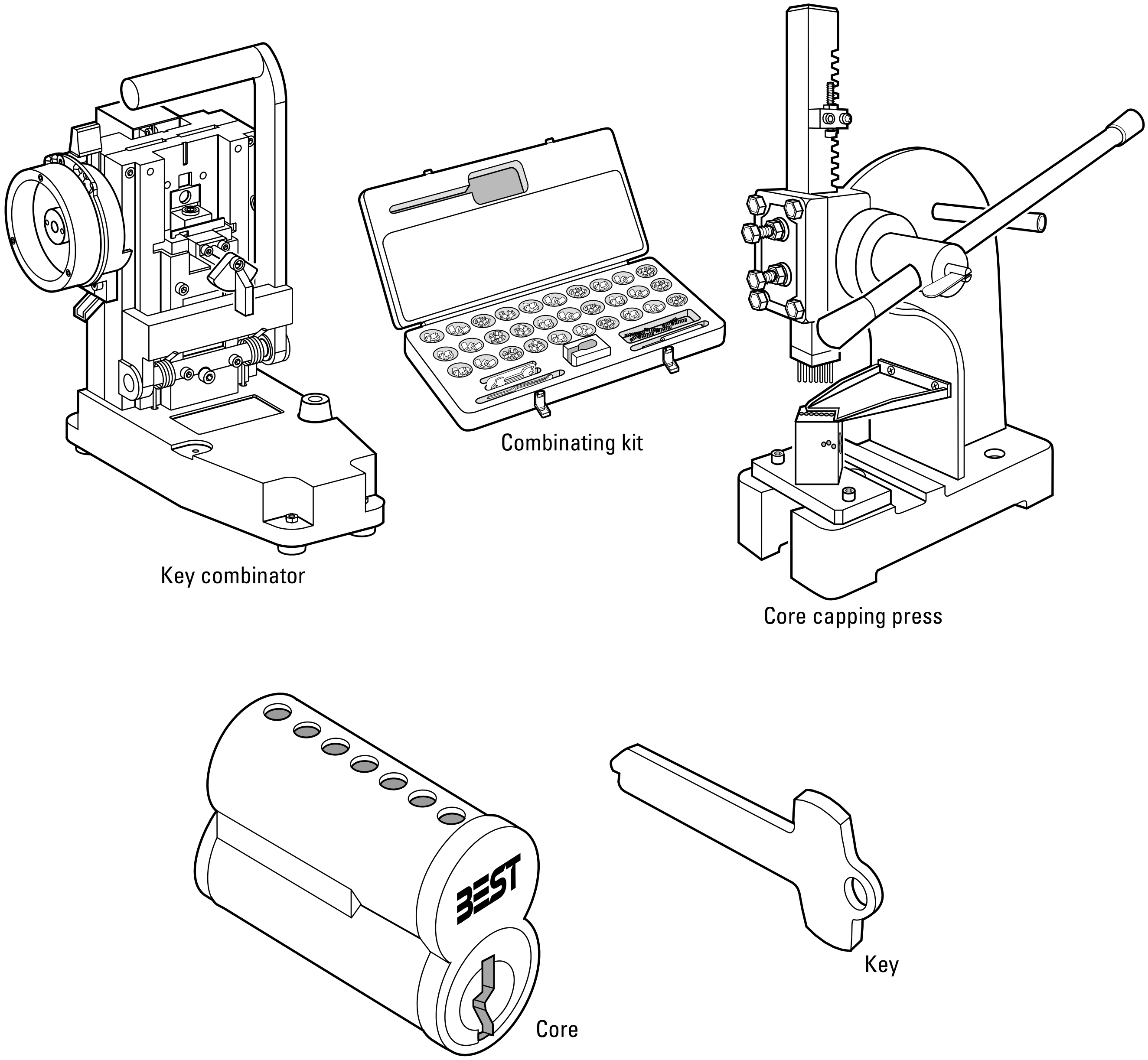


Figure 1.1 Core and key product family

CERTIFICATIONS AND STANDARDS

- BEST cores conform to ANSI/BHMA 156.5.

DOCUMENTATION PACKAGE

The following documentation is available to help you with the installation, operation, and maintenance of your BEST cores and keys along with associated service equipment. These documents also can be ordered separately from the product.

Document Title	Doc. No.
Installation Instructions for Construction Cores	T35533
Operating Instructions for AD432 Key Combinator	T35531
Operating Instructions for AD433 Key Combinator	T35529
Operating Instructions for AD502 Micrometer Key Gauge	T35530
Key Combinator Service Manual	T35532
A2 System Service Manual	T35534
A3 System Service Manual	T35535
A4 System Service Manual	T35536

TECHNICAL SUPPORT

Support services

When you have a problem with a BEST core or key, your first resource for help is the *Core and Key Service Manual*. If you cannot find a satisfactory answer, contact your local BEST Representative.

Telephone technical support

A factory-trained Certified Product Specialist (CPS) is available in your area whenever you need help. Before you call, however, please make sure that the product is in your immediate vicinity, and that you are prepared to give the following information:

- what happened and what you were doing when the problem arose
- what you have done so far to correct the problem.

Best Access Systems Representatives provide telephone technical support for all core and key products. You may locate the representative nearest you by calling (317) 849-2250 Monday through Friday, between 7:00 a.m. and 4:00 p.m. eastern standard time; or visit the web page, www.BestAccess.com.

2 PARTS

The following pages contain descriptions and figures of cores, keys, and tools for servicing them.

OVERVIEW OF THE BEST CORE

Exploded view of the 1C 7-pin core

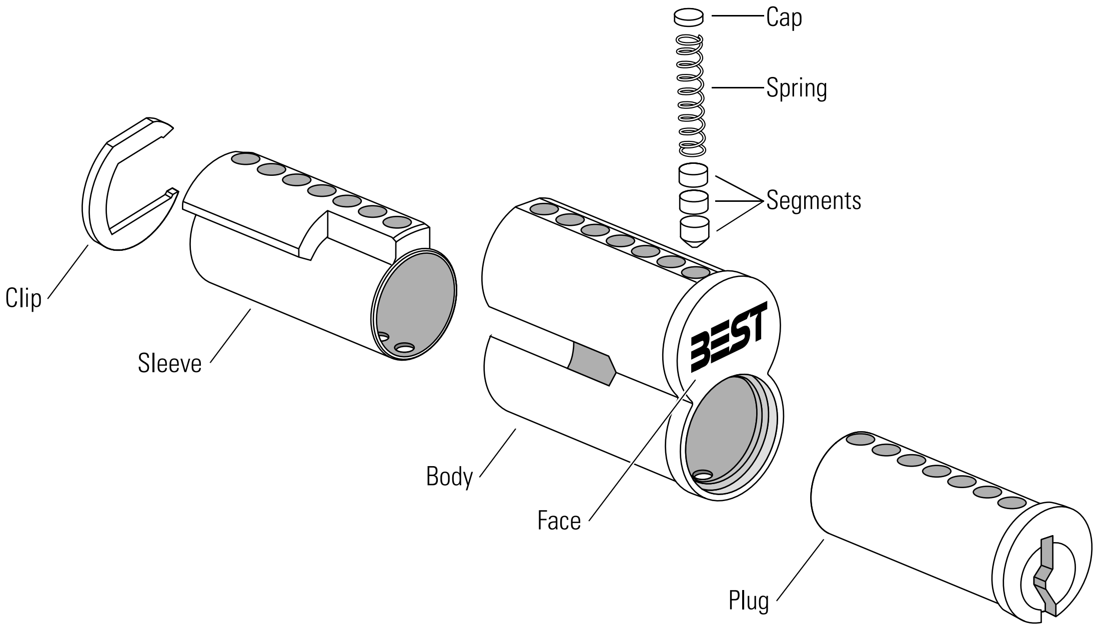


Figure 2.1 1C 7-pin core

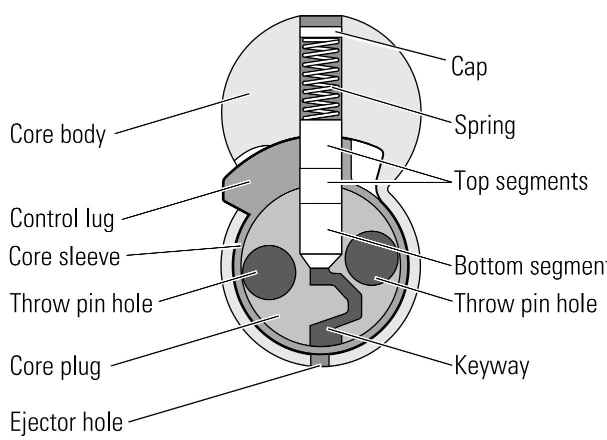


Figure 2.2 Cross section view of a core

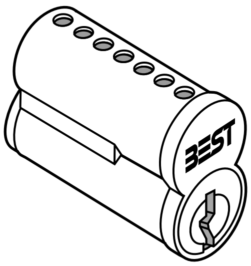
Core descriptions and figures

Use the following table to help you order a BEST core.

1C Core type	7 Core size	A Keyway	1 Combinating code	Options	606 Standard finishes
1C–Standard 1CP–Premium key system 1CC0BP–Plastic construction core 2C–Extended plug 3C–European 5C–High security 6C–Core for 4S	5–5-pin (1C core only) 6–6-pin (1C and 2C cores only) 7–7-pin	Designate specific keyway (A, E, etc.)	1–Uncombinated 2–Combinated	Blank–Standard B–Pick & drill resistant C–Dust cover D–Drill resistant K–Key trap P–Pick resistant S–Set screw (6C only) T–Key retained operation (6C only) W–Wear resistant	605–Bright brass 606–Satin brass 612–Satin bronze 613–Oxidized satin bronze, oil rubbed 625–Bright chromium plated 626–Satin chromium plated
See Table 2.3 for more information.				See Table 2.4 for more information.	

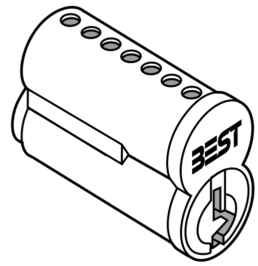
Table 2.3 Core type descriptions

1C core



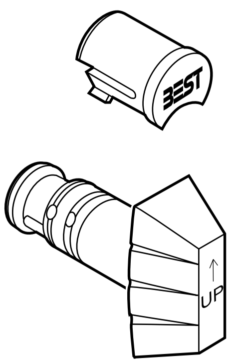
Standard interchangeable core.

1CP core



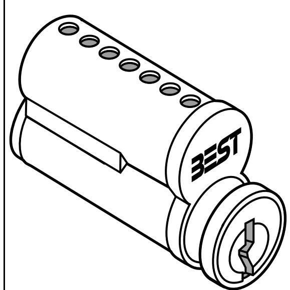
Premium interchangeable core.

1CC0BP core



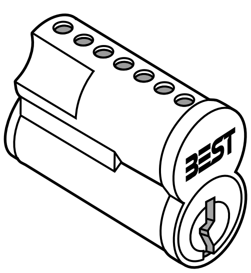
Black plastic, non-keyed construction core used to secure interior doors at a construction site.

2C core



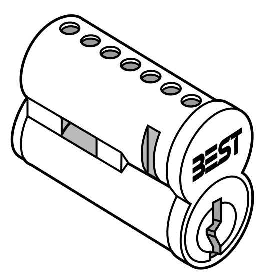
Interchangeable core used in the 8L mailbox lock.

3C core



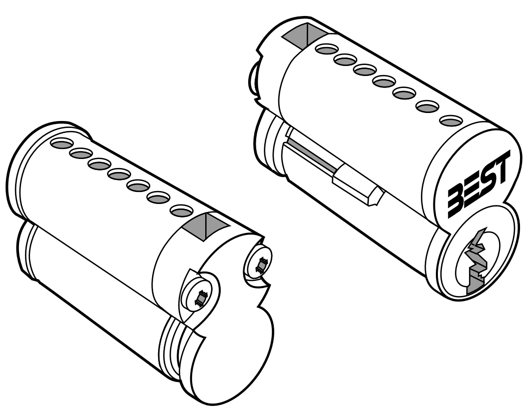
Interchangeable core used with the 8E European lock adaptation.

5C core



High security interchangeable core used in the 1E cylinder for mortise applications.

6C core[a]



Interchangeable core used in the 4S sliding door cylinder lock.

Regardless of the cores's finish, the lost-motion assembly on the back of the core has a stainless steel finish.

a. The set screw style is not shown.

Table 2.4 Core options

Option	Nomen- clature	Description
Pick & drill resistant	B	Provides enhanced resistance to picking and drilling the core. Hardened ball bearings are used in the throw pin holes and hardened stainless steel segments are used as the top and bottom segments in the first two barrels of the core. Spooled segments are used as the top and bottom segments in each remaining barrel of the core.
Dust cover	C	Prevents the keyway from accumulating dust and dirt. Stainless steel spring-loaded dust cover is installed over the keyway. For part numbers, see page 2–8. Note: If the core is housed in a cylinder, use the cylinder dust cover instead of the core dust cover for maximum protection.
Drill resistant	D	Provides enhanced resistance to drilling the core. Hardened ball bearings are used in the throw pin holes and hardened stainless steel segments are used as the top and bottom segments in the first two barrels of the core.
Key trap	K	Eliminates a key from the system by trapping it in the core. This option is useful if a key has been lost, or if someone has a key and will not give it back.When the key is inserted into the core and is turned, the key is trapped in the core. The key cannot be returned vertically nor withdrawn from the core. The core and trapped key must be drilled out of the lock. This special core is modified at the factory to match the key that you want to trap.
Pick resistant	P	Provides enhanced resistance to picking the core. Spooled segments are used as the top and bottom segments in each barrel of the core.
Set screw (for 6C core only)	S	Alternate design of the 6C core used in the 4S sliding door cylinder lock. A set screw is used to hold the core in the lock.
Key retained (for 6C core only)	T	Provides an extra measure of security by trapping the key in the core while the core is unlocked. The core stays locked unless the key is left in it. A sleeve without a slot is used to hold the key in the core.
Wear resistant	W	Provides longer life for cores in high traffic areas. Hardened stainless steel segments are used as the bottom segments in each barrel of the core.

Segments, springs, and caps

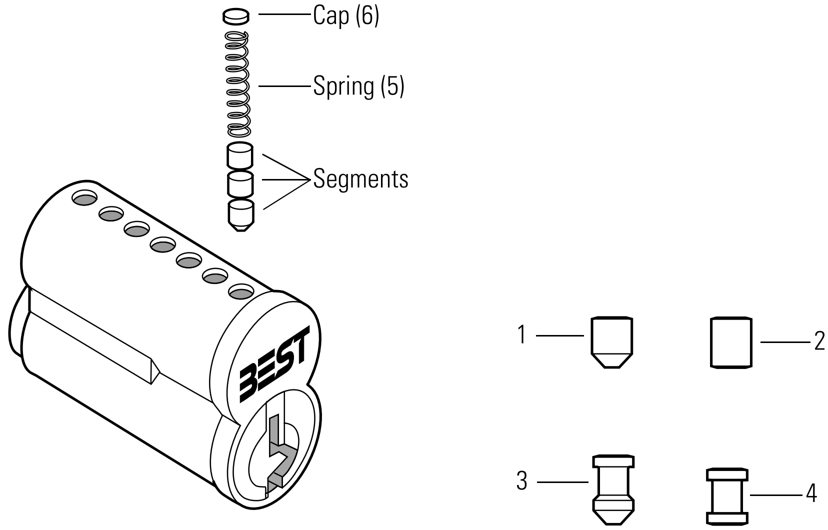


Figure 2.5 Segments, springs, and caps

Item	System	Nomen-clature	Description
1	A2	A	Standard beveled (bottom) segment. Available in nickel silver or hardened stainless steel.
	A3	C	
	A4	E	
2	A2	B	Standard flat (top) segment. Available in brass or hardened stainless steel.
	A3	D	
	A4	F	
3	A2	A	Spooled beveled (bottom) segment. Available in nickel silver.
	A3	C	
	A4	E	
4	A2	B	Spooled flat (top) segment. Available in brass.
	A3	D	
	A4	F	
5		22S 22S20M	Spring (500 per package) Spring (20,000 per package)
6		21C	Cap (500 per package)

Note: For more information, see the *A2 System Service Manual* (T35534), the *A3 System Service Manual* (T35535), and the *A4 System Service Manual* (T35536).

UL application of the 5C core

The 5C core is used in the 1E7J4 and 1E7K4 high-security cylinders. It is also used in the 71B, 81B, and 91B high-security padlocks.

To have the 1E7J4 cylinder qualify for the Underwriters Laboratories (UL) high-security rating, the 5C core must be combinated and loaded at the factory. Likewise, any core that needs to be recombinated and reloaded must be sent to the factory. If the 5C core is combinated and loaded outside of the factory, the cylinder no longer qualifies for the UL rating, and the UL-stamped cylinder faceplate cannot be used.

The 1E7K4 cylinder does not have the UL-stamped faceplate. You can combinate and load the 5C core to be used in a 1E7K4 cylinder. For high-security applications, combinate and load the 5C core as you would any other core *with the following exceptions*:

- Use hardened stainless steel segments in barrels six and seven.
- Use spooled segments in all remaining barrels, except where 6B segments are required. In those cases, use standard 6B segments.

Note: 5C cores used in 71B, 81B, and 91B padlocks do not need to be combinated and loaded as described above to provide high-security features.

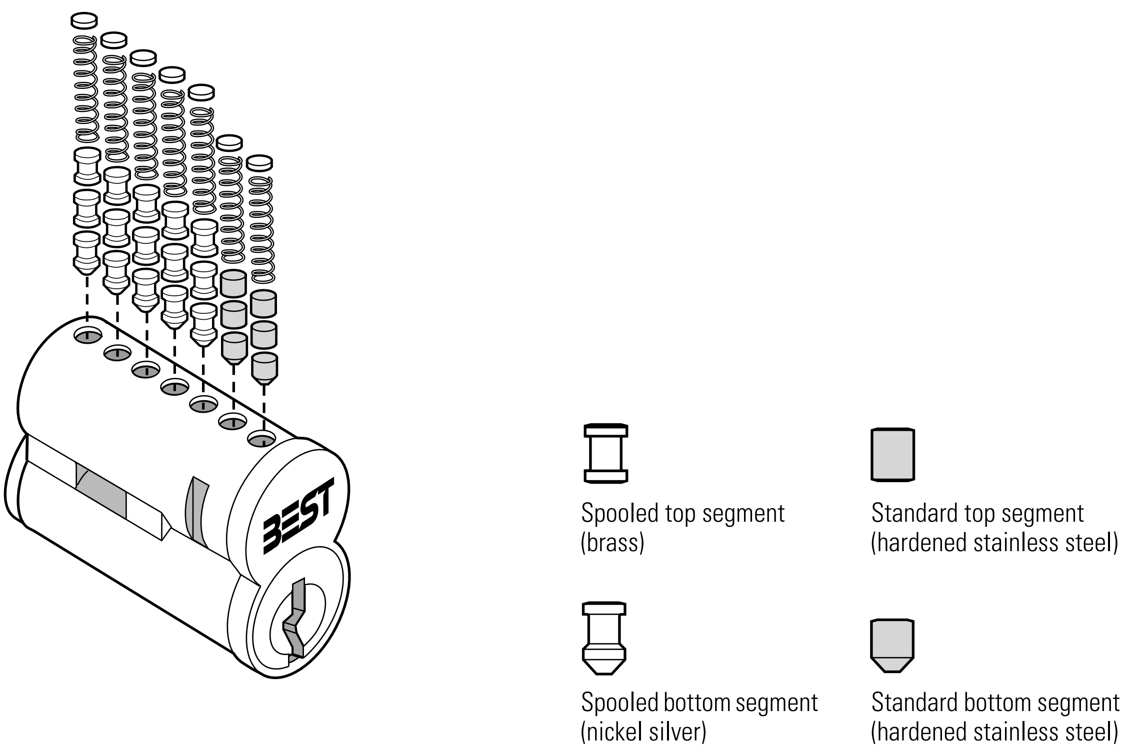


Figure 2.6 Loading the 5C core for the 1E7K4 cylinder

Dust cover option

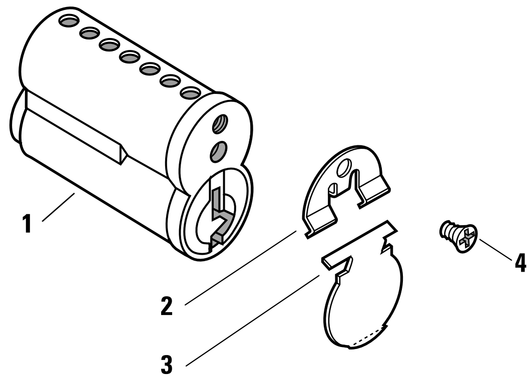


Figure 2.7 Dust cover components

Item	Part No.	Description
1	A40305	Core
2	B26247	Dust cover hinge
3	A00127	Dust cover
4	A40083	#4-40 Pan head screw

Overview of the BEST key

Diagram of the 1A key

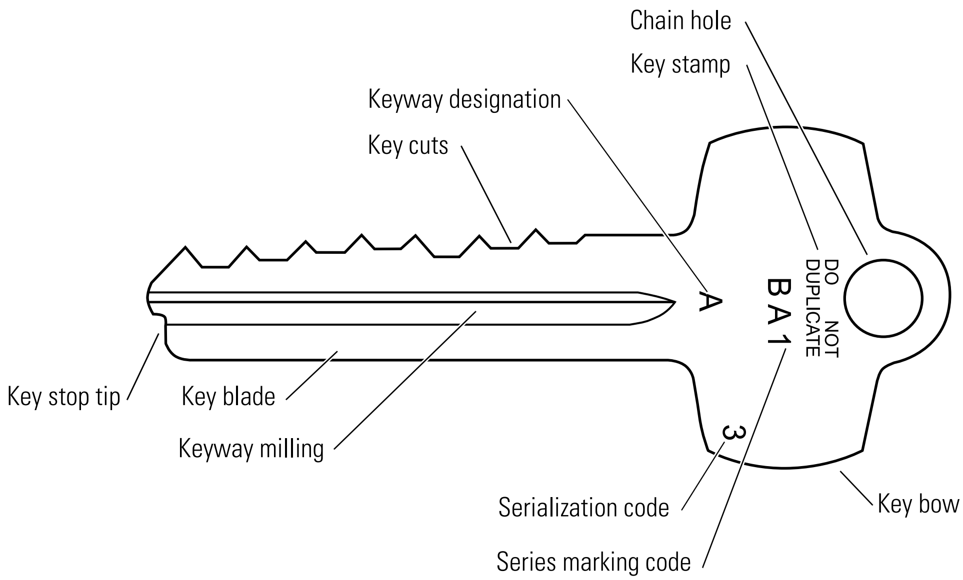


Figure 2.8 Standard key features

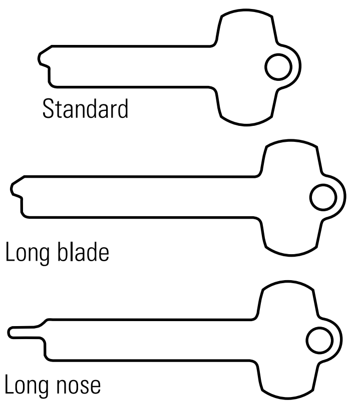
Key types

1A Key shape (bow)	1 Key type	A Keyway	1 Cut code	Key stamp[a]	Options
1A-Standard 1AP-Premium (PKS) 2A-Round bow 3A-Rectangular bow 4A-Access bow 9A-Extractor keys and blockout blades. 9AP-Blockout blade (Premium) See Table 2.9 for more information.	0-Blockout blade 1-Operating or blank 2-Control 3-Master 4-Submaster 5-Grandmaster 9-Extractor key	Designate specific keyway or keyways if multiple milling[b] is required. (A, E, etc.)	1-Blank 2-Cut	KS654 & KS292-Standard embossing supplied if not designated. KS567-Premium (For 1AP only) KS594-Premium (For 1AP only) Specify KS#-Price for most custom design stamps available upon request. See Table 2.10 for more information.	B-Long blade[b] H-No hole (For 2A only) N-Long nose[b] NKW-No keyway designation (Standard for 1AP) P-Plastic insert (For 4A only) S-Key serialization

a. You must designate a front key stamp and a back key stamp. There is no standard back key stamp for the Premium key.
b. Not available for 1AP keys.

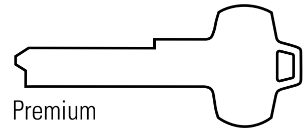
Table 2.9 Key type descriptions

1A key



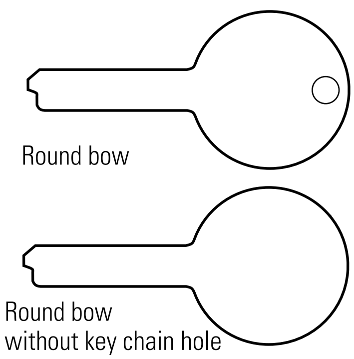
Standard key with the standard bow.

1AP key



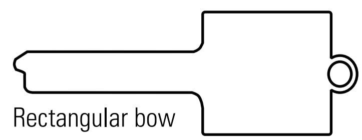
Premium key used with the 1CP core.

2A key



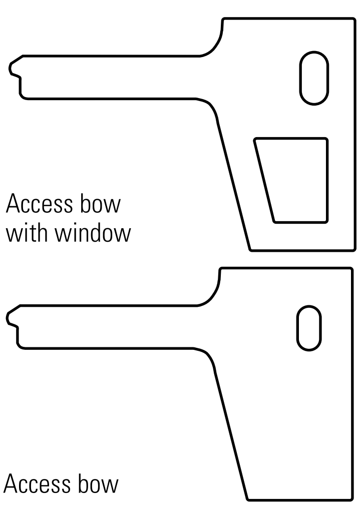
Standard key with the round bow.

3A key



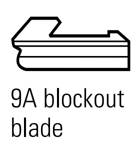
Standard key with a rectangular bow.

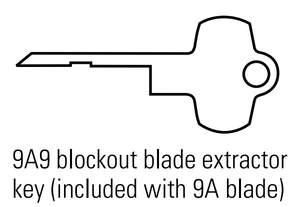
4A key



Standard key with the large offset bow. Comes with or without a window and plastic insert. Used with hotel locks.

9A blockout blade and 9A9 blockout blade extractor





The 9A blockout blade slides in a keyway and blocks out other keys. 9A9 is a special tool used to remove the 9A blockout blade segment.

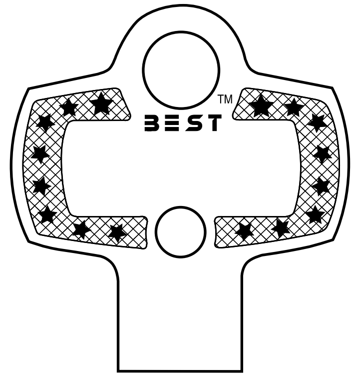
Table 2.10 Key stamp descriptions

KS654 key stamp



Standard front key stamp for full embossing.

KS292 key stamp



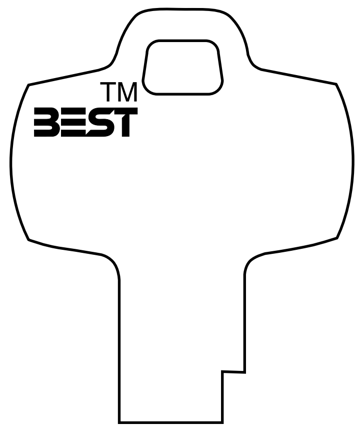
Standard back key stamp for embossing.

KS567 key stamp



Standard front key stamp for the 1AP premium key.[a]

KS594 key stamp



Alternative front key stamp for the 1AP premium key.[a]

a. There is no standard back key stamp for the 1AP premium key.

Note: Custom stamps are available upon request.

TOOLS

The following tools are used for servicing cores and keys.

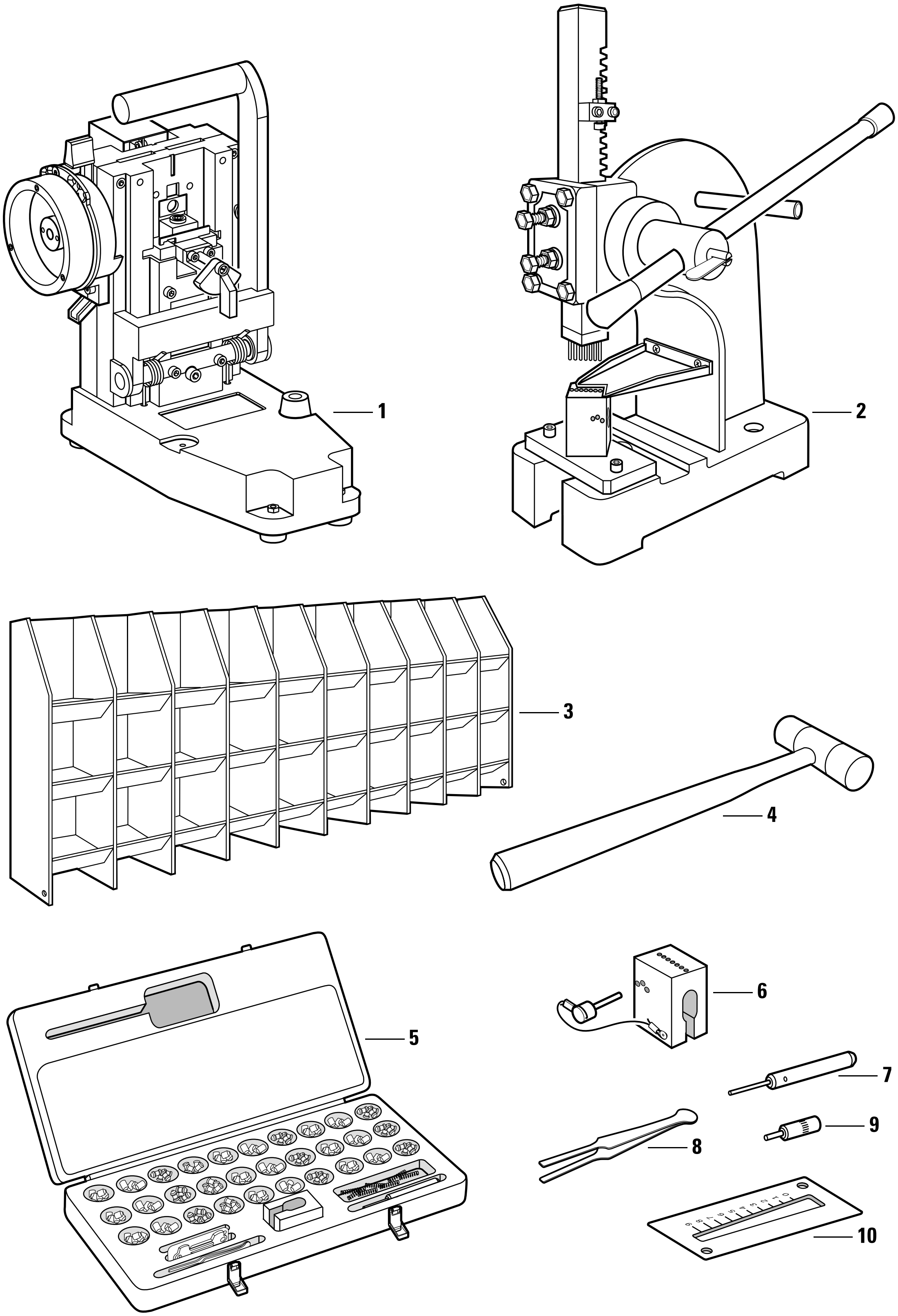


Figure 2.11 Tools used for servicing cores and keys

Item	Nomen-clature	Description
1	AD433	Key combinator[a, b]
2	CD517	Core capping press
3	CD433	Combinating bin
4	DD550	Combinating hammer
not shown	DD551	Plastic heads for combinating hammer
5	CD431	Complete combinating kit[b]
6	CD540	Capping block[c]
7	CD548	Ejector pin[c]
8	CD549	Tweezers[c]
9	CD547	Hand capping pin[c]
10	AD501	Key cut indicator[b, c]

a. For other parts associated with the key combinator, see the *Key Combinator Service Manual*.
b. Specify A2, A3, or A4 Keying System when ordering.
c. Also is included in the complete combinating kit (CD431).

The following tools are used for stamping cores and keys in your system.

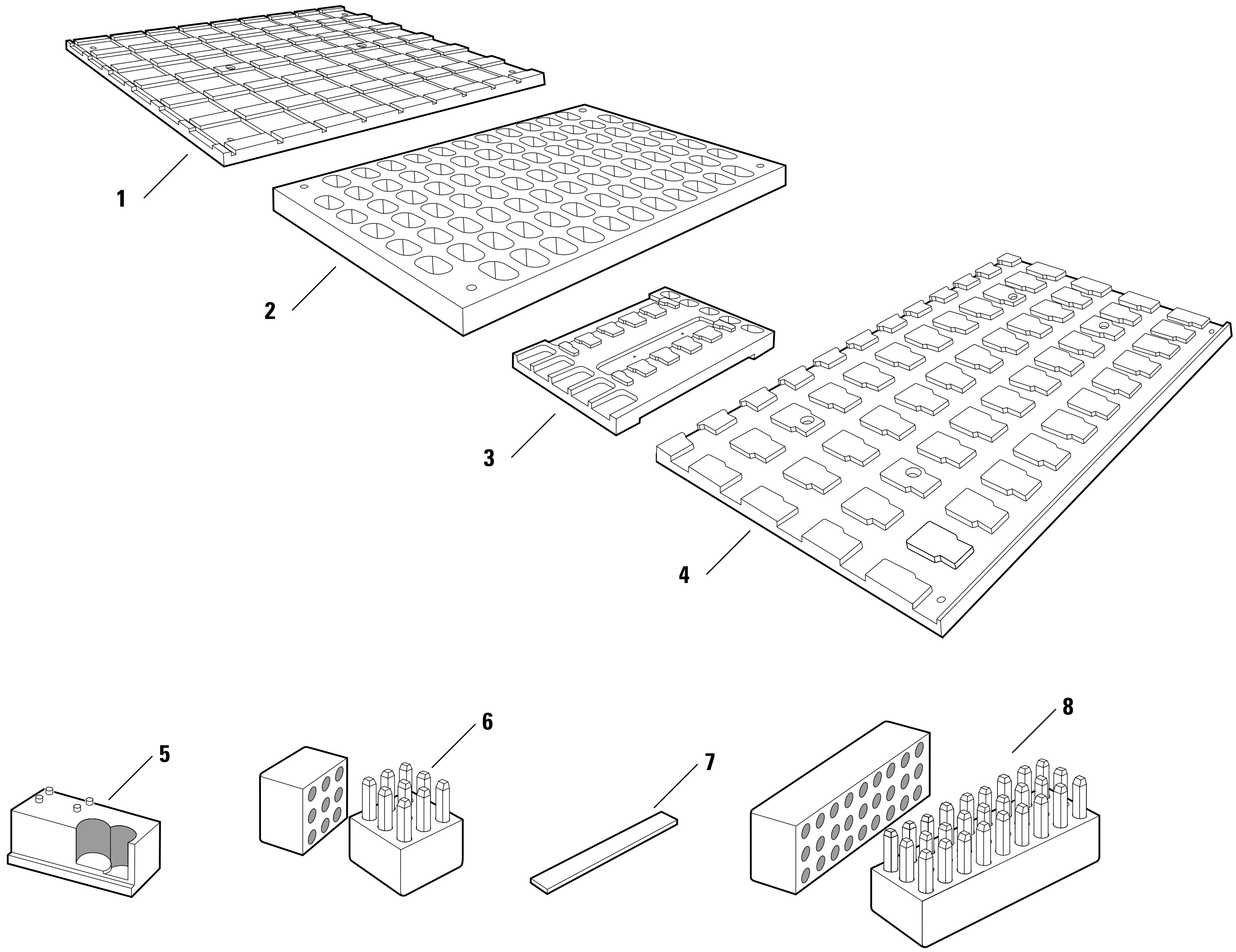


Figure 2.12 Stamping tools

Item	Nomen-clature	Description
1	CD504C	Core stamping plate–side only (for 50 cores)
2	CD504B	Core stamping plate–face only (for 87 cores)
3	DD514	Core/key marking plate
4	AD504A	Key stamping plate (for 55 keys)
5	DD513	Core/key marking block
6	DD503	Number dies (1/16″ or 3/32″)
7	DD514A	Magnetic strip[a]
8	DD502	Letter dies (1/16″ or 3/32″)

a. A set of 3 is included with the core/key marking plate (DD514).

The following items are used to lubricate cores and keys.

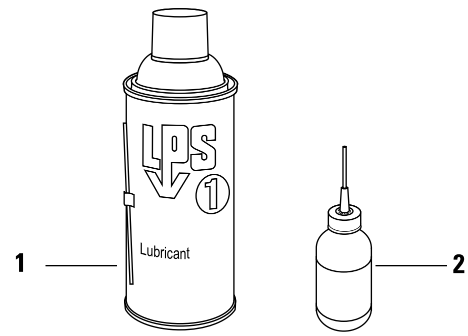


Figure 2.13 Lubrication items

Item	Nomen-clature	Description
1	DD537	LPS spray can
2	CD535	Graphite gun
not shown	CD535A	1 pound container of graphite

3 SERVICING AND TROUBLESHOOTING

This chapter contains instructions for servicing components and troubleshooting common problems.

PLACING PIN SEGMENTS, SPRINGS, AND CAPS IN A CORE

Overview of how a key works in the core

BEST cores have two shearlines. The upper, or control, shearline lets you remove the core from the door. The lower, or operating, shearline lets you operate the key in the lock.

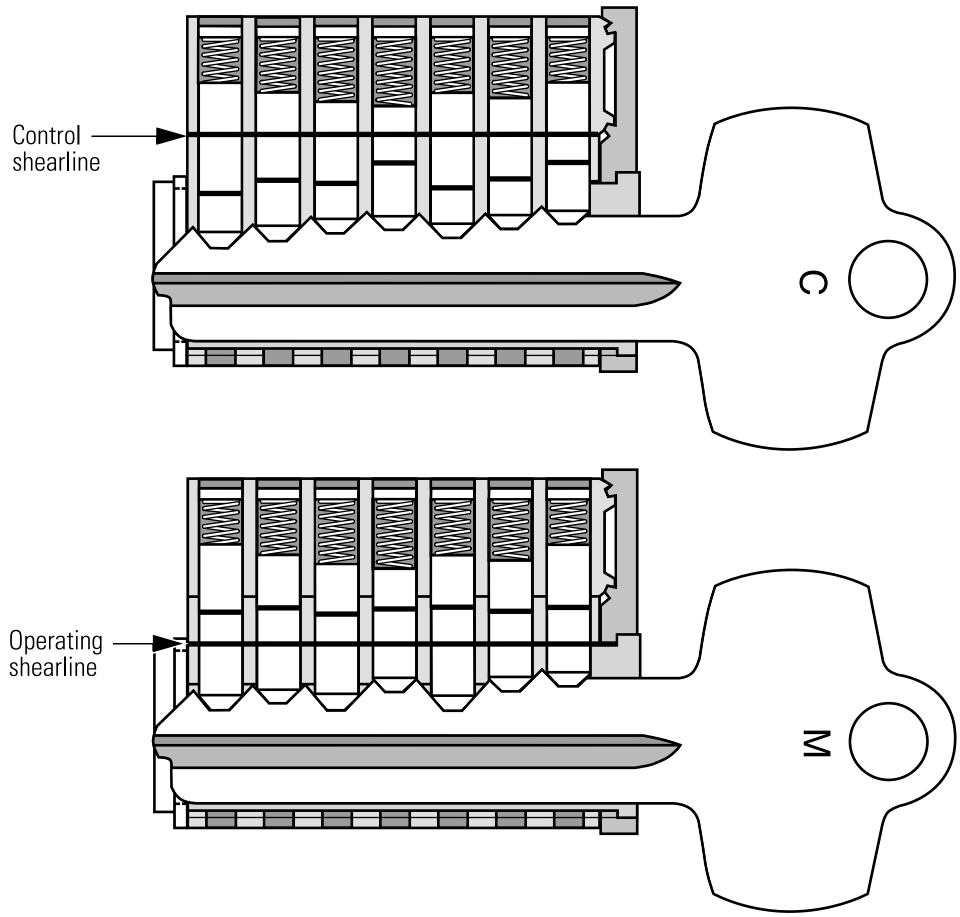


Figure 3.1 Cross section of a core showing control and operating shearlines

Loading the core

To determine the specific sequence of segments to place in each core, please refer to the *Masterkey Code Sheet* and the *Combinating Instruction Sheet* supplied to you by BEST.

Note: For information about loading cores used for UL applications, see page 2–7.

1. Before you begin, identify the parts of the core you will be working with. The front of the core is identified by the BEST logo. Barrel number one is at the back of the core.

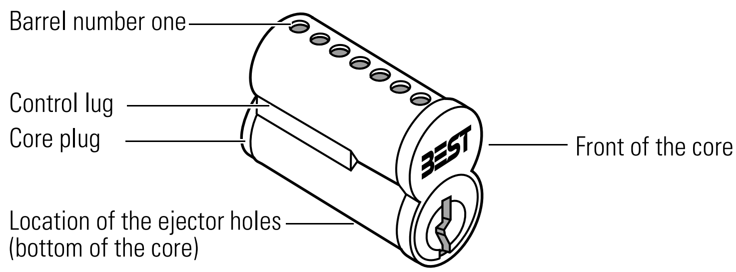


Figure 3.2 Identifying the parts of the core

2. Insert the ejector pin into the notch on the back of the sleeve and push the control lug into the thrown (extended) position. Remove the ejector pin from the notch.

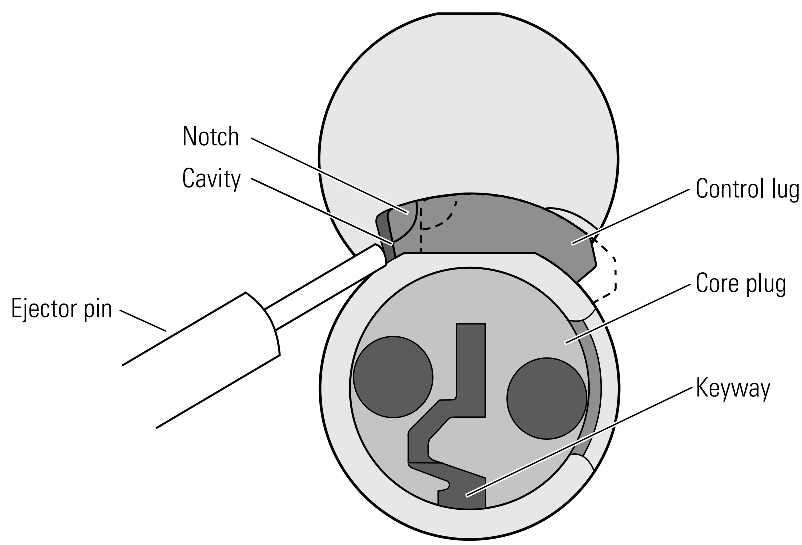


Figure 3.3 Pushing the control lug into the thrown position

3. Insert the ejector pin into the cavity between the lug and core body to hold the lug in the thrown position. Use your thumb and forefinger to rotate the core plug until the keyway is straight up and down, and the bottom of the keyway is in the six o'clock position. Remove the ejector pin from the cavity.

4. Insert the ejector pin into barrel number seven to ensure that the barrels stay aligned. Leave the ejector pin inserted while you perform the next step.
5. Use your combinating instruction sheet to determine what segments are required for barrel number one. Insert the bottom segment, beveled end down, into barrel number one.
6. Remove the ejector pin from barrel number seven and use it to tap down the segment until it seats at the bottom of the barrel. You should see the segment protruding into the keyway.
7. Insert the next required segment into barrel number one. Use the ejector pin to tap down the segment until it is seated.
8. Repeat step 5 through step 7 until all of the required segments are loaded into all of the barrels.

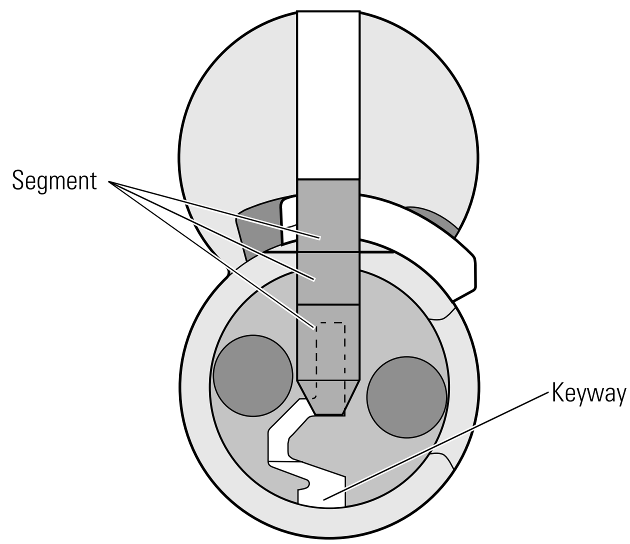


Figure 3.4 Inserting the segments into the barrel

9. Insert the stop pin into the appropriate hole in the side of the capping block to align the core barrels with the holes in the capping block.

10. Insert the core into the capping block.

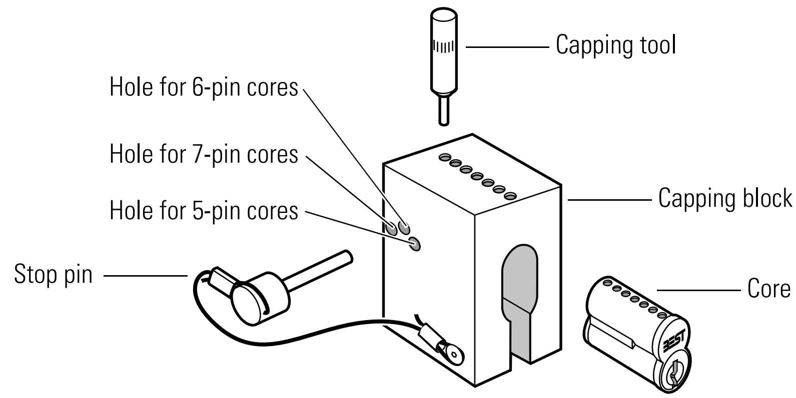


Figure 3.5 Inserting the stop pin and core into the capping block

11. Insert a spring into barrel number one. Place a cap over the barrel.

    Note: Do not cut the segment springs and insert an extra cap.

12. Insert the capping tool into barrel number one. Use a hammer to tap the capping tool and drive down the cap until the bottom of the capping tool hits the top of the capping block.

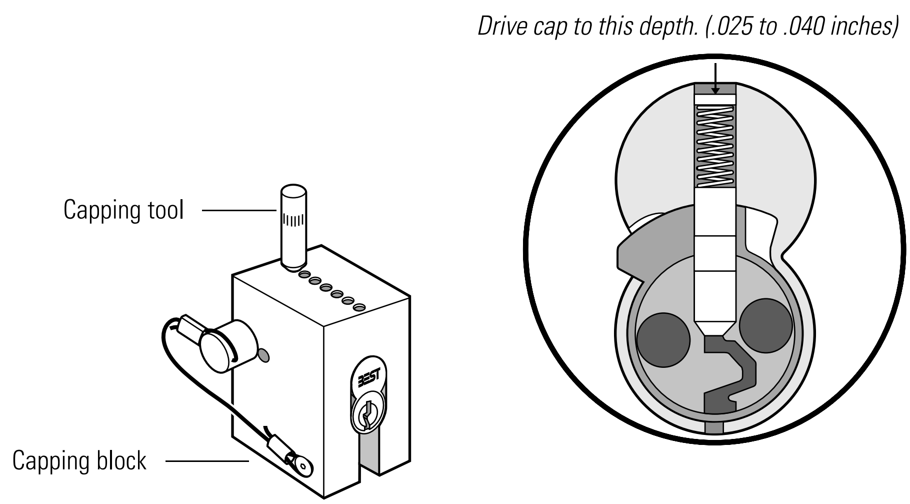


Figure 3.6 Seating the cap in the barrel

13. Repeat step 11 and step 12 until all of the barrels are capped.
14. Test all keys, including the control, grandmaster, and operating keys, in the core to make sure that each barrel is loaded correctly.

    Note: If a barrel is not loaded correctly, insert the ejector pin through the ejector holes and tap out the segments, spring, and cap. Discard the used segments, spring, and cap, and reload the barrel.

Special guidelines

When stamping and loading the core, follow the guidelines below.

- If the core is not operating smoothly while you are loading it, do not tap the core against a metallic block. Use a block made of nylon or an equivalent material.
- Do not use a metal-headed hammer on cores. Use a plastic-headed hammer only.
- Do not use excessive force to stamp core markings on the side of cores. Excessive force may cause the barrel opening to close slightly.
- Do not stamp the core on the bottom lobe.
- Do not enlarge segment holes. This may cause problems with segment capping.

Checking a core for proper operation

Periodically test all of your keys, including the control, grandmaster, and operating keys in the core to make sure that the core is operating properly.

Insert a key in the core. If you can insert, turn, and remove the key easily, the core and key are working properly. If not, see the troubleshooting section on page 3–11.

REPLACING A DUST COVER ASSEMBLY

1. Unscrew the screw and remove the dust cover and dust cover hinge.
2. Place the dust cover over the key hole in the core so that the lip faces away from the core. Place the dust cover hinge on the face of the core with the prongs covering the dust cover, as shown in Figure 3.7. Install the screw.

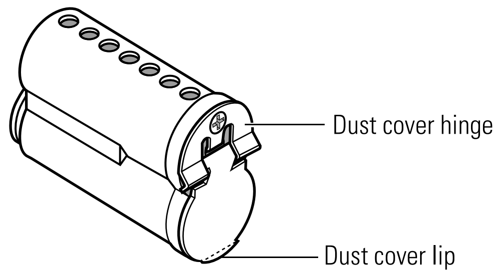


Figure 3.7 Dust cover assembly in position

LUBRICATING A CORE

Create a preventive maintenance plan that includes lubricating the core. To extend the life of the core, lubricate it regularly. Powdered graphite is the best choice for lubrication; LPS spray is also used.

Caution

Do not lubricate a core with oil. Doing so will attract dirt.

For powdered graphite lubrication:

1. Remove the core from the lock.
2. Dip a key in graphite. With the core inverted, insert the key into the keyhole and remove it; repeat several times, allowing the graphite to penetrate the barrels. *OR*

   With the core inverted, spray graphite into the keyhole. Insert the key into the keyhole and remove it; repeat several times, allowing the graphite to penetrate the barrels.

For LPS lubrication:

1. Remove the core from the lock.
2. Spray compressed air or LPS lubricant into the core to clean out all of the existing lubricant.
3. With the core inverted, spray the lubricant into the key opening, allowing the spray to penetrate the barrels.

Caution

Do not mix graphite with LPS lubricant.

Thawing a Core

Caution

Do not heat the core with a propane torch. This will cause internal damage and possibly cause the core to become inoperable.

If the core is frozen, try the following techniques to thaw it.

- Spray LPS lubricant into the key opening to reduce the moisture inside the core.
- Heat the key and insert it into the core.
- Spray a commercial lock antifreeze or ice dissolver into the core.

TROUBLESHOOTING

This table summarizes the possible causes for the most common core and key problems. The causes are listed in the order of likelihood. (The most likely cause is first, and so forth.)

You notice...	Possible causes include...	You should...
It is difficult to insert or remove the key.	a. Key's keyway is not compatible with the core.	a. Look at the end of the key and the keyway of the core. If the profiles do not match, check your *Masterkey Specification* to see what type of keyway must be used with the core.
	b. Key is damaged.	b. Check the key to see whether it has been damaged. If it has, replace the key.
	c. There is foreign material on the key or in keyway of the core.	c. Check the key and the keyway of the core for foreign material. If there is foreign material, remove it with compressed air or LPS lubricant.
	d. Keyway of the core has been damaged.	d. Check the keyway of the core for damage. If it is damaged, contact your BEST Representative.
	e. Barrels of the core are not loaded correctly.	e1. Check inside the keyway to see whether the ends of the bottom segments that protrude into the keyway are flat or beveled. If any of the bottom segments appear to be inserted incorrectly, reload that barrel with new segments, spring, and cap. Make sure the beveled end of the bottom segment is inserted first into the barrel. e2. Perform the thumb check procedure to see whether the height of any segment stack varies. (See page 3–14.) e3. If the problem still is not solved, check the *Masterkey Specification* for errors. Reload the core and cut new keys as necessary.
	f. Caps are inserted too deeply into the barrels.	f. From the top of the core, look into the barrels, or use a depth gauge to see whether one or more caps is inserted more deeply into the barrel. (The correct cap depth is .025 to .040 inches from the top of the core.) If so, reload the barrel with new segments, spring, and cap.

You notice…	Possible causes include…	You should…
Key does not rotate the core plug or control lug.	a. Key is cut improperly.	a. Use the key cut indicator to determine whether the key was cut correctly. (See page 3-15.) If the key cuts are not correct, cut a new key.
	b. Barrels of the core are not loaded correctly.	b. Reload the core with new segments, springs, and caps. If the key still does not rotate, check the *Masterkey Specification* for errors.
	c. Key combinator needs to be recalibrated.	c. If you cut a new key and you are still having the problem, the Key Combinator may need to be recalibrated. See the *Key Combinator Service Manual*.
Key does not rotate smoothly.	a. Key is cut improperly.	a. Use the key cut indicator to determine whether the key was cut correctly. (See page 3-15.) If the key cuts are not correct, cut a new key.
	b. Barrels of the core are not loaded correctly.	b1. Check inside the keyway to see whether the ends of the bottom segments that protrude into the keyway are flat or beveled. If any of the bottom segments appear to be inserted incorrectly, reload that barrel with new segments, spring, and cap. Make sure the beveled end of the bottom segment is inserted first into the barrel. b2. Perform the thumb check procedure to see whether the height of any segment stack varies. (See page 3-14.) b3. If the problem still is not solved, check the *Masterkey Specification* for errors. Reload the core and cut new keys as necessary.
	c. Key combinator needs to be recalibrated.	c. If you cut a new key and you are still having the problem, the Key Combinator may need to be recalibrated. See the *Key Combinator Service Manual*.

You notice…	Possible causes include…	You should…
Core does not insert into cylinder/receptacle.	a. Core lug is not fully retracted.	a. Check behind the lug for any foreign material. Clean it as necessary.
	b. Throw pins inside the receptacle are not aligned with the holes in the core.	b. Check to see whether the throw pins are out of alignment. Use a screwdriver to align the throw pins with the throw pin holes in the core.
	c. There is foreign material in the cylinder/receptacle.	c. Check the cylinder/receptacle for foreign material. Clean it as neccessary.
	d. For mortise locks only, the cylinder set screw is installed too tightly.	d. Remove the mortise case faceplate and loosen the cylinder set screw.

Peforming the thumb check procedure

Perform the following steps to check each barrel of the core to make sure that the segment stacks are of equal height.

1. Insert the ejector pin into the number one ejector hole.
2. Use your thumb to mark the depth on the ejector pin. Keep your thumb in place.

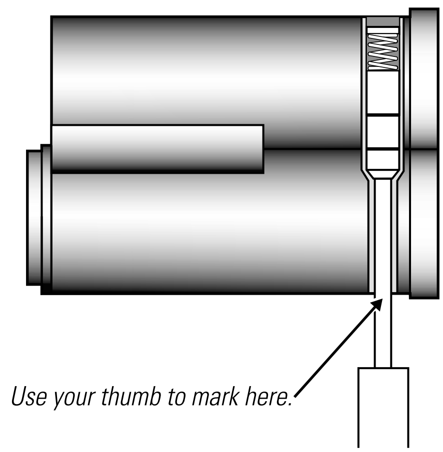


Figure 3.8 Using the ejector pin to mark the segment stack height

3. Insert the pin into the other ejector holes. If the segment stack height varies, use the ejector pin to force out the segments, springs, and caps of the barrels that are incorrectly loaded. Discard the used segments, springs, and caps. Reload the barrels with new segments, springs, and caps.

Using the key cut indicator

1. Insert your key into the key cut indicator that is appropriate for your keying system, with the key cuts facing the numbers on the key cut indicator.
2. Slide the key until it contacts the indicator at the top and bottom. Read the key cut number that aligns with the position of the key.
3. Make sure that the key cut corresponds to the key cut for that position listed on your *Masterkey Specification*. If the key cut does not match what is listed, cut a new key.
4. Repeat step 1 through step 3 for each key cut on your key.

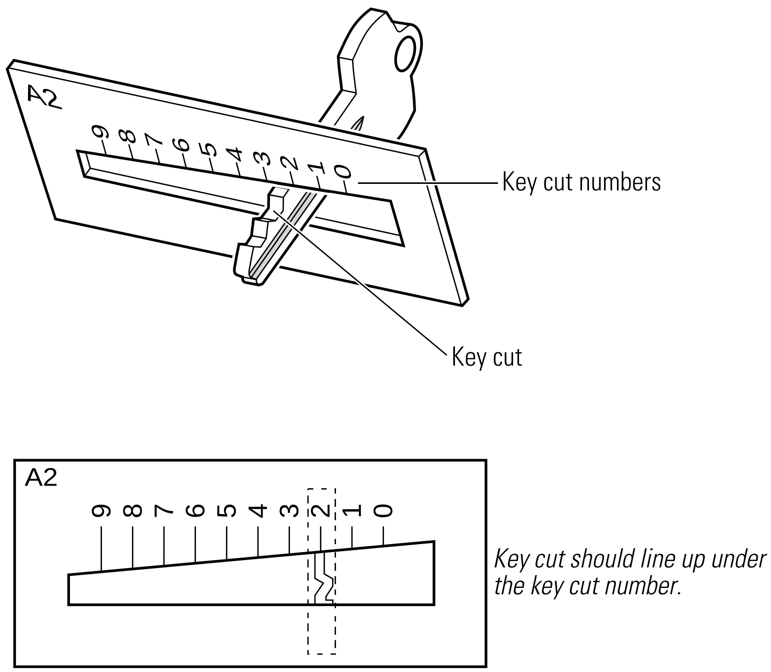


Figure 3.9 Using the key cut indicator

A GLOSSARY

Combinating The process of determining the combination of the length of segments used and the order they are loaded into the barrels of a core. Also, the process of making the cuts of different depths in a key blade that let it operate or remove a corresponding core.

Control key A key that can insert or remove any core in a system.

Grandmaster key A key that can unlock any lock in a system.

Interchangeable core A figure-8 shaped device that contains all mechanical parts for a masterkeyed system. The interchangeable core can be removed by a special control key and can be recombinated without disassembling the lock.

Key blank A key that has no key cuts.

Key cut A notch in a key.

Keyway The slot in the core used to receive and guide the key. Also, the shape of the key blade determined by the location, length, width, and depth of grooves milled in the key blade.

Loading a core The process of inserting segments, springs, and caps into each barrel of a core according to predetermined specifications.

Masterkeying A method of keying locks that allows a single key to operate many locks, but also allows each lock to be operated by its own key.

Operating key A key that can unlock a single lock within a system.

Shearline The alignment of segments in the core that is created when a key is inserted. The shearline lets the key operate the core or remove the core from the lock.

Submaster key A key that can unlock only specified groups of locks within a system.

Thumb check procedure A series of steps performed to check that the segment stacks are of equal height in each barrel of a core.

B

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